[Scale](https://en.wikipedia.org/wiki/Scaling_(geometry)" \t "_blank) generally means to change the **range** of the values. The shape of the distribution doesn’t change. Think about how a scale model of a building has the same proportions as the original, just smaller. That’s why we say it is drawn to scale. The range is often set at 0 to 1.

[Standardize](https://en.wikipedia.org/wiki/Standard_score) generally means changing the values so that the distribution **standard** deviation from the mean equals one. It outputs something very close to a normal distribution. Scaling is often implied.

**StandardScaler**

[StandardScaler](https://scikit-learn.org/stable/modules/generated/sklearn.preprocessing.StandardScaler.html) standardizes a feature by subtracting the mean and then scaling to unit variance. Unit variance means dividing all the values by the standard deviation. StandardScaler does not meet the strict definition of *scale* I introduced earlier.

StandardScaler results in a distribution with a standard deviation equal to 1. The variance is equal to 1 also, because *variance = standard deviation squared*. And 1 squared = 1.

StandardScaler makes the mean of the distribution 0. About 68% of the values will lie be between -1 and 1.

The symbol for Standard Deviation is **σ** (the Greek letter sigma).

This is the formula for Standard Deviation:



To calculate the standard deviation of those numbers:

* 1. Work out the [Mean](https://www.mathsisfun.com/mean.html) (the simple average of the numbers)
* 2. Then for each number: subtract the Mean and square the result
* 3. Then work out the mean of **those** squared differences.
* 4. Take the square root of that and we are done!

The formula actually says all of that, and I will show you how.

# How to Find the Mode or Modal Value

The mode is simply the number which appears **most often**.

### **Example:**

In {6, 3, 9, 6, 6, 5, 9, 3} the Mode is 6, as it occurs most often.

## Finding the Mode

To find the mode, or modal value, it is best to put the numbers **in order**. Then **count** how many of each number. A number that appears **most often** is the **mode**.

### **Example:**

3, 7, 5, 13, 20, 23, 39, 23, 40, 23, 14, 12, 56, 23, 29

**In order** these numbers are:

3, 5, 7, 12, 13, 14, 20, **23, 23, 23, 23**, 29, 39, 40, 56

This makes it easy to see which numbers appear **most often**.

In this case the mode is **23**.

### **Another Example: {19, 8, 29, 35, 19, 28, 15}**

Arrange them in order: **{8, 15, 19, 19, 28, 29, 35}**

19 appears twice, all the rest appear only once, so **19 is the mode**.